

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

EET1156 – BASIC ELECTRICAL TECHNOLOGY
(ME)

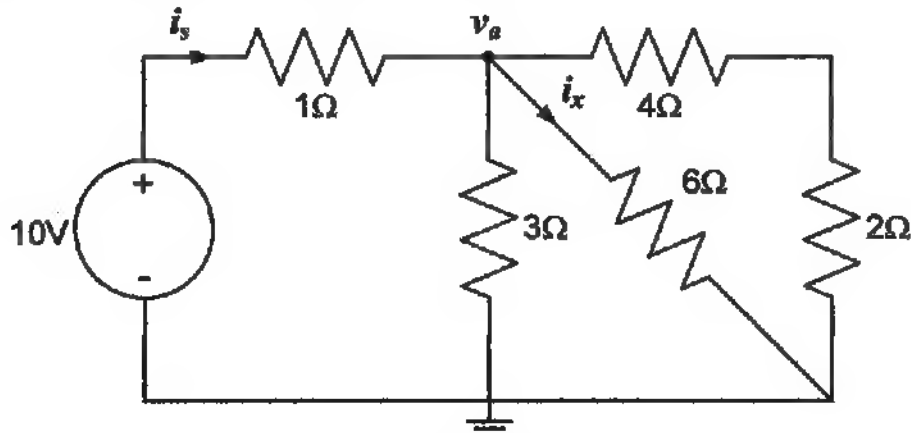
9 MARCH 2017
2:30 PM – 4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

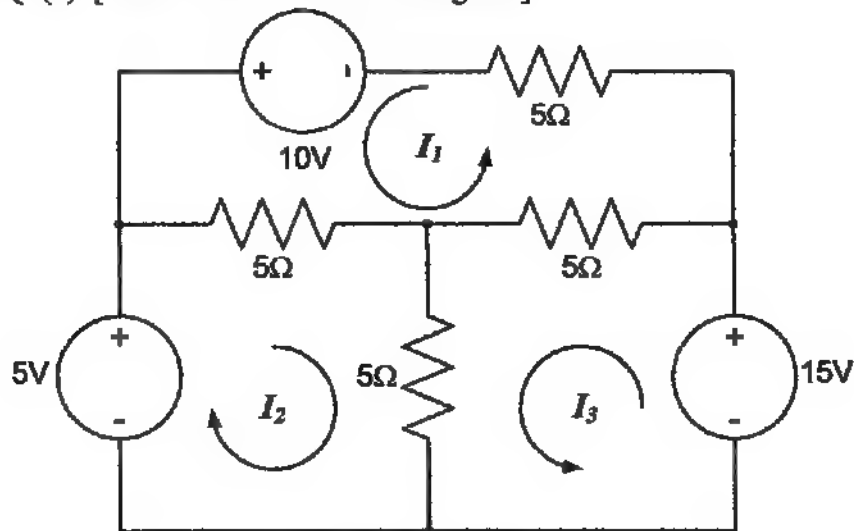
1. This Question paper consists of 6 pages including cover page with 5 Questions only.
2. Attempt **ALL** the questions. The distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

- a) Determine v_a of the circuit in Figure Q1(a).
Then solve for i_s and compute the current i_x .

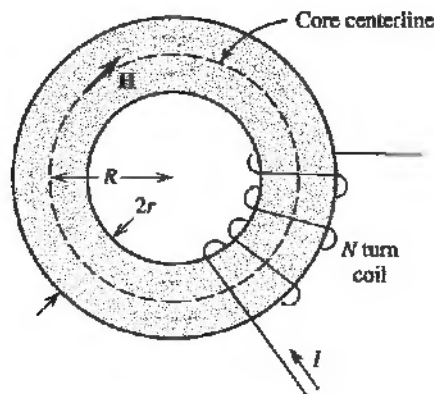
**Figure Q1(a)****[8 marks]**

- b) Perform *mesh analysis* to determine the mesh currents I_1 , I_2 and I_3 of the circuit in Figure Q1(b). [Follow the mesh directions given].

**Figure Q1(b)****[12 marks]****Continued...**

Question 2

- a) In a parallel plate capacitor with air between 2 plates, the cross section area is $6 \times 10^{-3} \text{m}^2$ and the separation between the plates is 5mm.
- i. Calculate the capacitance of the capacitor [2 marks]
 - ii. If this capacitor is connected to 120V supply, what would be the charge on each plate? [2 marks]
 - iii. How would charge on the plate be affected if a 5mm thick mica sheet of $\epsilon_r = 6$ is inserted between the plates while the voltage supply remains connected. [2 marks]
 - iv. What is the flux density in (iii)? [2 marks]
- b) The coil in Figure Q2 has 150 turns and is wound on a silicon sheet steel with a diameter of 4cm. The mean radius, R is 10cm and the toroidal core has a circular cross section. If this toroidal carries the coil current of 2A and permeability of the core is given of 3×10^{-3} . Determine the
- i. cross section area, A . [2 marks]
 - ii. reluctance of the toroidal. [2 marks]
 - iii. magnetic flux density, B . [4 marks]
 - iv. intensity, H and mmf, F . [4 marks]

**Figure Q2****Continued...**

Question 3

- a) Figure Q3(a) is a circuit with $R_1 = 8 \Omega$, $C_1 = -j2 \Omega$, $L_1 = j4 \Omega$, $R_2 = 6 \Omega$, a current source with $I = 6 \angle 0^\circ$ A and a voltage source with $V = 30 \angle 30^\circ$ V. The arrow above the current source indicates the current flow orientation. Determine I_o .

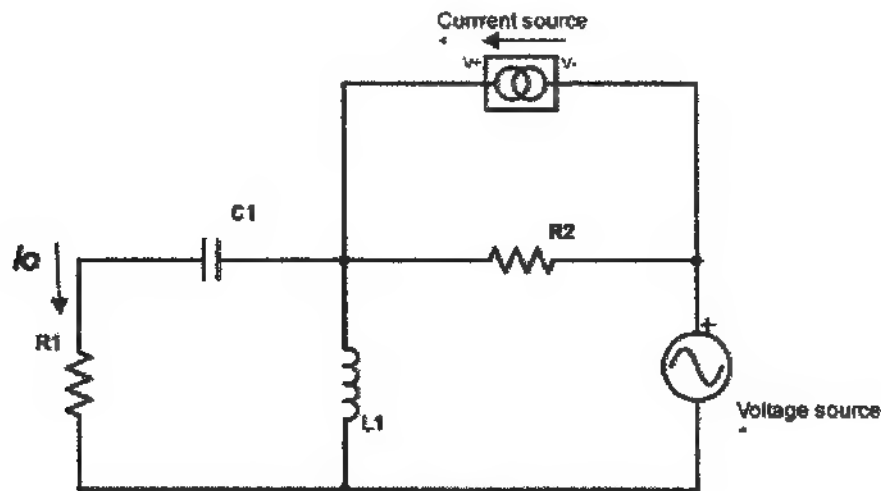


Figure Q3(a)

[8 marks]

- b) Given the current source has $I = 30 \sin 2t$ A, resistor $R_1 = 2 \Omega$, resistor $R_2 = 4 \Omega$, inductor $L_1 = 2$ H, capacitor $C_1 = 0.2$ F and the DC voltage source has an amplitude $3V_x$, determine V_1 and V_2 using *nodal analysis*. [Hint: use nodal analysis and matrices to solve for the final answer].

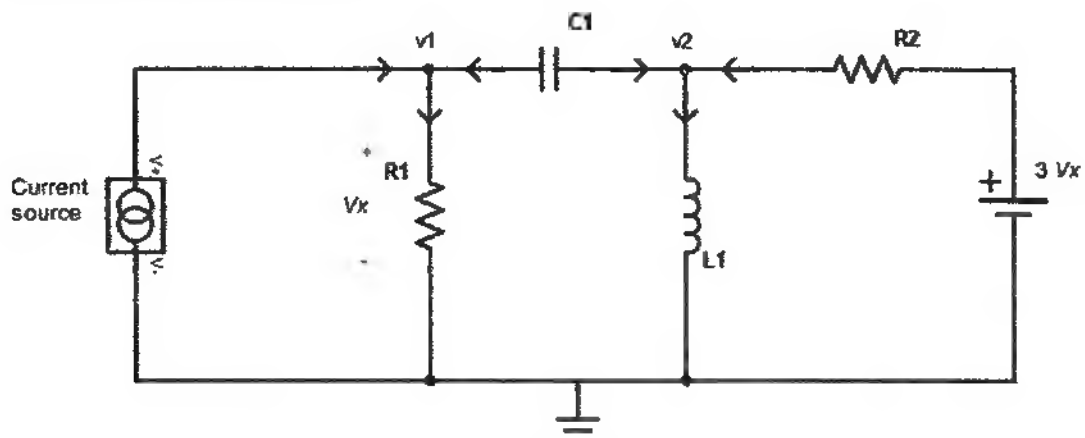


Figure Q3(b)

[12 marks]

Continued...

Question 4

- a) Figure Q4(a) shows a parallel diode configuration circuit where $R_1 = 600 \Omega$ and E has an amplitude of 20 V. Solve for V_o , I_t , I_{D1} and I_{D2} assuming both diodes, D_1 and D_2 have similar characteristics.

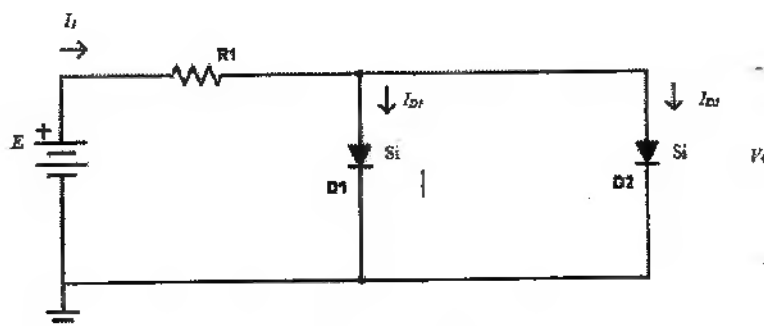


Figure Q4(a)

[6 marks]

- b) Figure Q4(b) shows a *fixed-bias configuration* where $V_{CC} = +10 \text{ V}$, $R_1 = R_B = 400 \text{ k}\Omega$, $R_2 = R_C = 1.8 \text{ k}\Omega$ and $C_1 = C_2 = 10 \mu\text{F}$. Assume $R_3 = R_E = 0 \Omega$ (short circuited), C_3 is a fully discharged capacitor (short circuited) and $\beta = 60$. Determine the following:

i. I_B and I_C

[3 marks]

ii. V_{CE}

[3 marks]

iii. V_B and V_C

[3 marks]

iv. V_{BC}

[2 marks]

v. I_{CSAT}

[2 marks]

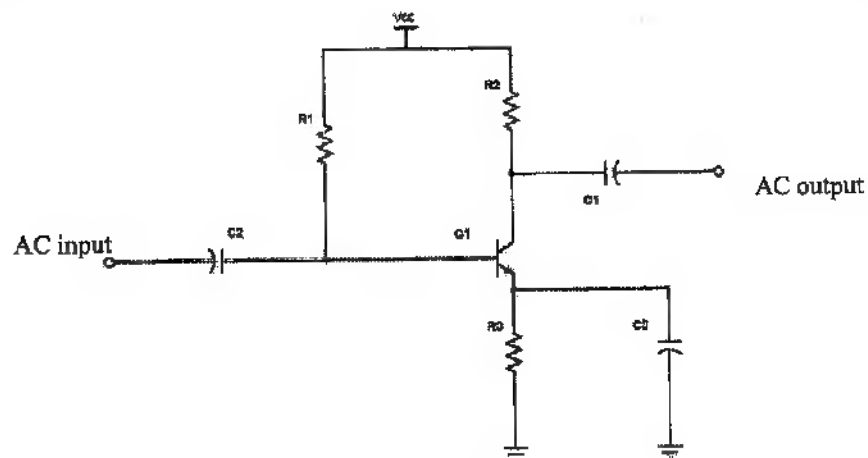


Figure Q4(b)

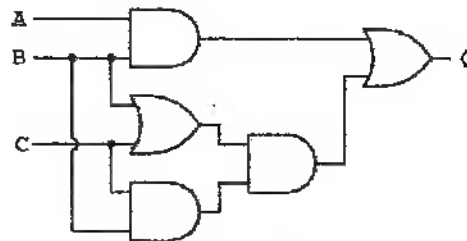
- c) Briefly describe the six characteristics of an *ideal operational amplifier*.

[6 marks]

Continued...

Question 5

- a) "I will take an umbrella with me if it is raining or the weather forecast is bad."
Based on this statement, compute a truth table to fulfil the conditions. [4 marks]
- b) Simplify the logic circuit in Figure Q5 using *Boolean logic*. [4 marks]

**Figure Q5**

- c) Given the following equation,

$$Y = \overline{A}BCD + \overline{A}BC\overline{D} + \overline{A}B\overline{C}D + \overline{A}B\overline{C}\overline{D} + B\overline{C}D + B\overline{C}\overline{D} + A\overline{B}CD + A\overline{B}D + A\overline{B}C\overline{D}$$
 solve for the simplest logic expression using *Karnaugh Map*. [7 marks]

End of paper.